

*Report on an Area of Local Magnetic Disturbance in East  
Loch Roag, Lewes, Hebrides.*

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(Communicated by Rear-Admiral Sir William Wharton, K.C.B., F.R.S. Received  
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Consequent upon a report received in October, 1902, that on passing eastward of Little Bernera Island at the entrance of East Loch Roag, the Northern Lighthouse Commissioners' vessel had observed her compass to be deflected  $5^{\circ}$  or  $6^{\circ}$ , an opportunity was taken by H.M.S. "Research" whilst surveying in the neighbourhood to verify the statement.

Steaming slowly over the ground, in a depth of 16 to 18 fathoms, sandy bottom, the deflection was seen to amount to  $10^{\circ}$  or  $11^{\circ}$ , and in a direction contrary to that which had hitherto been noticed by vessels passing over areas of magnetic disturbances in various parts of the world.

Beyond a few preliminary observations to ascertain the horizontal deflection of the needle, nothing further could then be done without special instruments. In the following year, however, the hydrographer, Admiral Sir W. J. L. Wharton, K.C.B., F.R.S., directed a more complete examination to be made, for which purpose a heeling error instrument and Lord Kelvin's deflector were supplied. In June, 1903, H.M.S. "Research" accordingly returned to East Loch Roag, and a week was devoted to making observations for variation, vertical force, and horizontal force at 73 stations, the ship being tautly moored at each.

Owing to the area to be examined lying in a position exposed to a heavy swell from the northward, which was constantly experienced, the observations were made under considerable difficulties.

The results are given in tabular form, from which diagrams have been constructed.

The maximum disturbance from the normal was found to be, for vertical force, 0.056 C.G.S. unit in an upward direction, and for variation  $11\frac{1}{2}^{\circ}$ , the north seeking end of the needle being repelled from the valley line, which lies nearly in the magnetic meridian.

The "Research" being a composite built ship, is subject to induction when placed in a magnetic field; measures of magnetic disturbances independently of the magnetism induced in the ship are, therefore, impracticable. For this

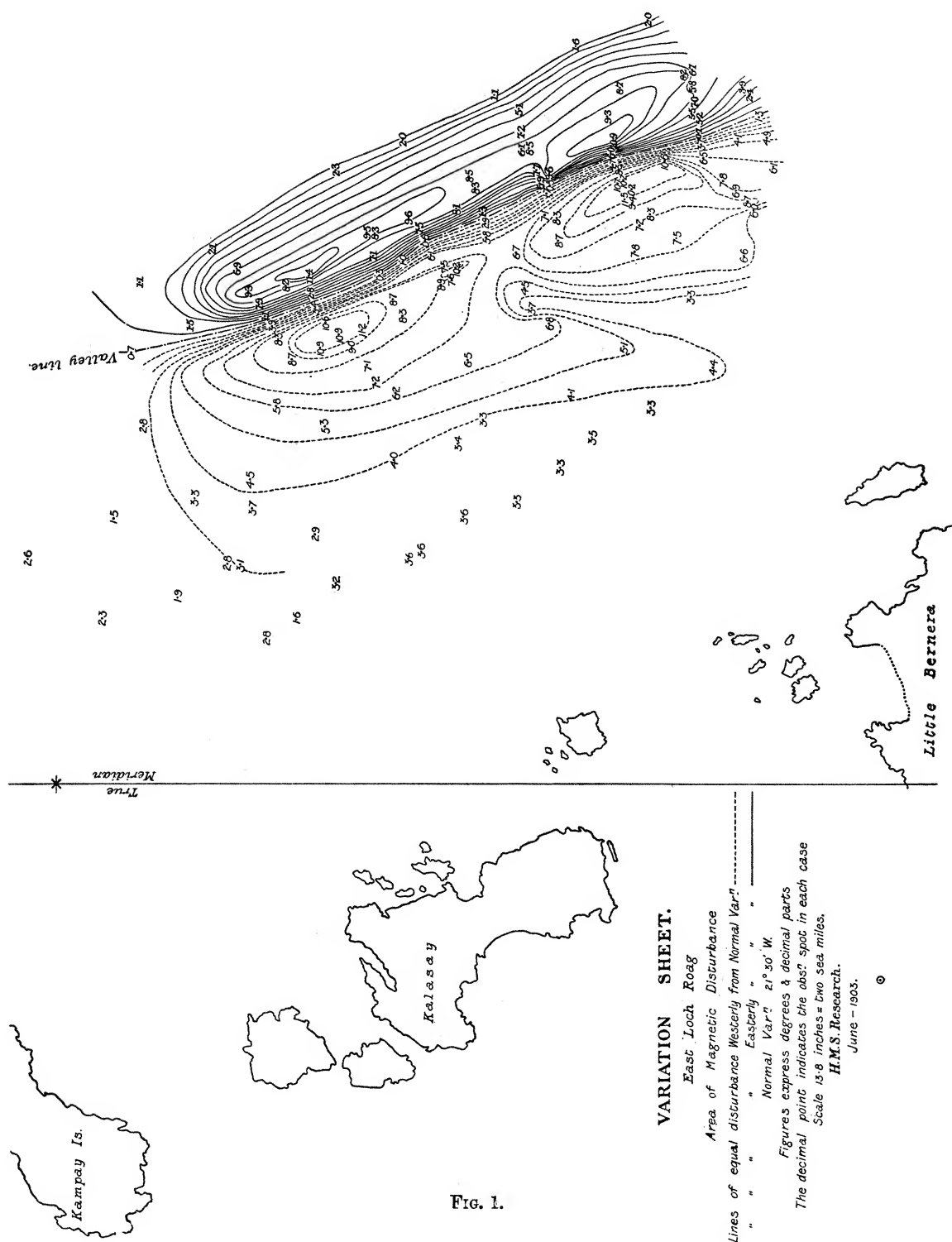


FIG. 1.

reason observations taken on board "Research" can only locate the "magnetic shoal" and measure its extent.

The methods adopted for the survey of this area of magnetic disturbance, so as to obviate as far as possible this limitation, are stated below.

*Variation.*—The ship was carefully swung for deviation in deep water in the vicinity, but outside the influence of the area of magnetic disturbance.

When in position on the magnetic shoal and tautly moored, the bearing of a distant peak was noted from the standard compass (45 feet abaft the bridge compass and 12 feet above the sea). The ship's position being accurately plotted on the original plotting sheet of Loch Roag (6·9 inches to the sea mile), the true bearing of the distant peak was taken off.

*Vertical Force.*—The observations for vertical force were obtained on board with the heeling error instrument, at the position of the bridge compass.

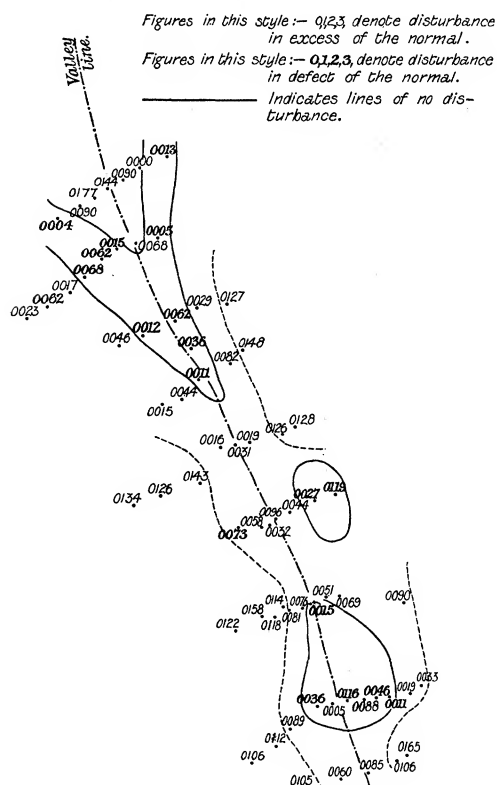


FIG. 2.—Horizontal force. Disturbance from normal in C.G.S. units. Decimal point indicates observation spot in each case. Normal horizontal force in locality, from Professor Thorpe's observations, 0·15507 C.G.S. unit.

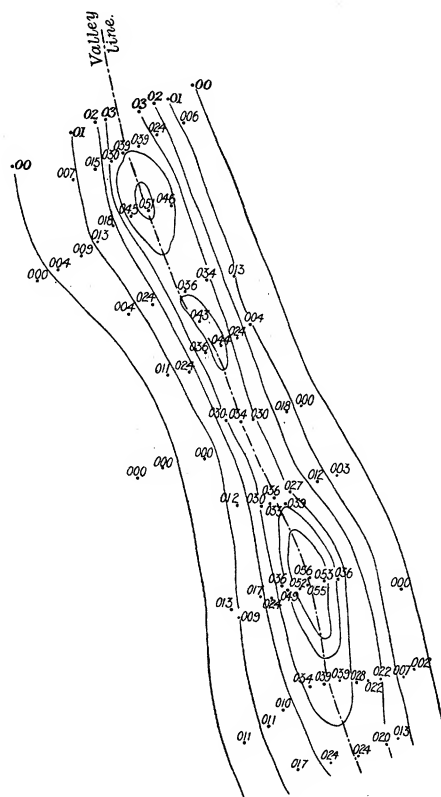


FIG. 3.—Vertical force. Diagram of lines of equal disturbance in C.G.S. units upwards from normal. Normal vertical force in locality, from Professor Thorpe's observations, is 0·451 C.G.S. unit.

16 feet above the sea. The bridge compass and pillar, without its correcting magnets, were subsequently landed at Rücker and Thorpe's Station on Great Bernera Island, and the heeling error instrument was observed to be horizontal with the movable weight set at 38·8 scale divisions.

*Horizontal Force.*—The observations for horizontal force were obtained on board with the bridge compass (corrected by fore and aft and athwartship magnets) by the aid of Lord Kelvin's deflector set at 12·0 scale divisions, and used as a sine deflector.

After obtaining observations for horizontal force within the area of magnetic disturbance, the ship's head having been noted at each observation, she was then taken into deep water outside the area of disturbance, and the observations repeated with her head in corresponding directions. The bridge compass and pillar, without its correcting magnets, were then landed at Rücker and Thorpe's Station, and with the deflector set at 12·0 scale divisions, the angle of deflection was observed to be 35·15'.

*General Remarks.*—The anchors were laid out as far apart as possible on either side of the "valley line," and the ship was hauled slowly across with a spring on the cable to keep her head quite steady whilst the observations were being made. A heavy swell caused the ship to roll considerably, making satisfactory observations of the horizontal force especially very difficult to obtain.

The agreement of the "valley line," resulting from the observations for variation and for vertical force, is noticeable.

Placing the (full size) horizontal force sheet over the vertical force sheet, it is observed that the change in value of the horizontal force takes place at the lowest points in the "valley" or line of least vertical force, and shows the repellent force of the magnetism at those lowest points.

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